Artificial Neural Networks

$f: X \longrightarrow (Y)$; $D = \{(x_n, t_n)_{n=1}^N\}$ → of course this is valid both for classification and regression

Artificial Neural Networks are just another way to define a parametric model $\hat{f}(x; \theta)$ that will approximate the real, unknown, target function.

Artificial Neural Network { parametric model $\hat{f}(x; \theta)$ / error function / loss function / argmin of error function → iterative gradient descent } components

Neural Networks are exactly the same thing as the other models seen so far.

Before

linear models with respect to the weights, non-linear in the inputs
linear models in θ

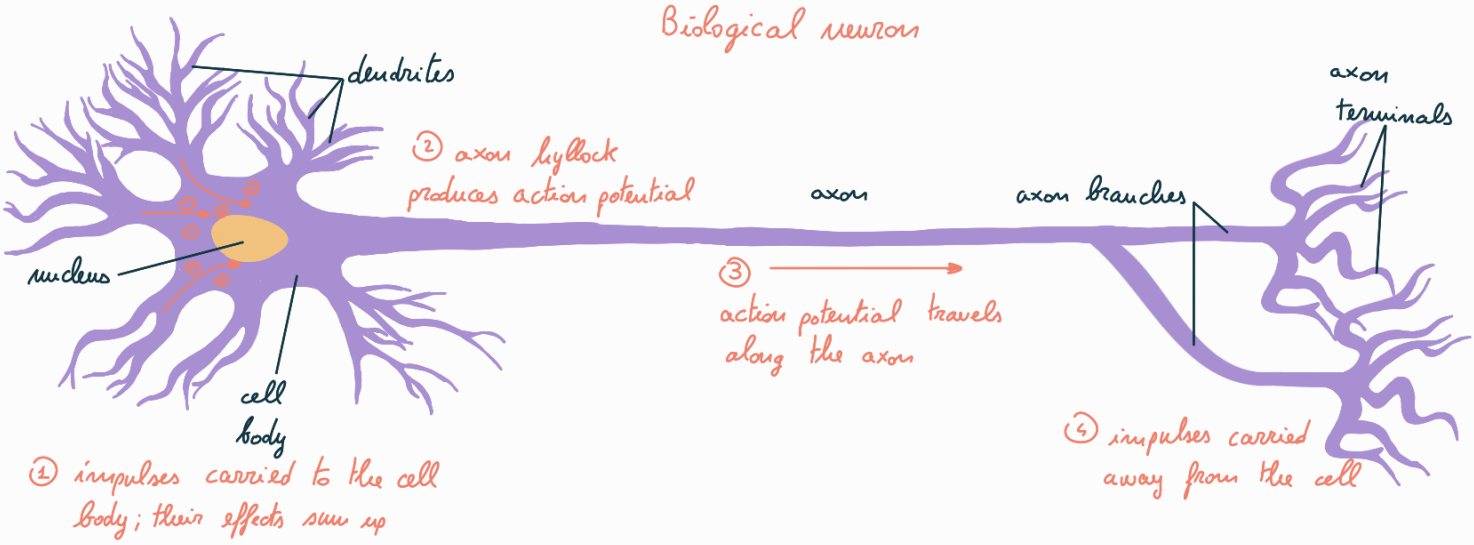
After

Neural Networks are non-linear models in the weights and in the inputs
non-linear models in θ

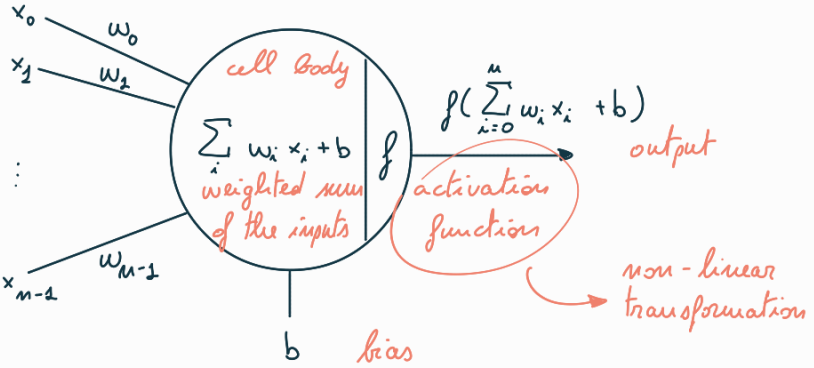
Another difference is that while with other methods you have to specify the kernel, in neural networks the kernel is automatically inferred.

NNs draw inspiration from brain structures

Biological neuron



Artificial neuron



inputs

Many of these units are connected to one another. We can create a complex network this way. We can have different types of structures.